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Abstract: The status of cheetahs *Acinonyx jubatus* in West Africa is poorly documented. In the literature, the species is reported to range in Gambia, in the South of Mauritania, West of Mali in the Boucle du Baoulé complex, in the North and South of Mali, and West of Burkina Faso at the western border and in a region extending on the border between eastern Burkina Faso, northern Togo, northern Benin and South West of Niger. In order to investigate the status of the cheetah in W National Park Niger and the Tamou total reserve of fauna (750 km², which adjoins it, a team from IRD/MNHN collected sightings of cheetahs from 1972 to 2003, as well as information about cheetah habitat (Fig.1) in this area. In this paper, we present the results of this investigation.
Survey of the Cheetah in W National Park and Tamou Fauna Reserve, Niger

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The status of cheetahs Acinonyx jubatus in West Africa is poorly documented. In the literature, the species is reported to range in Gambia, in the South of Mauritania, West of Mali in the Boucle du Baoulé complex, in the North and South of Mali, and West of Burkina Faso at the western border and in a region extending on the border between eastern Burkina Faso, northern Togo, northern Benin and South West of Niger (Marker 1998, Nowell & Jackson 1996).


Only a few observations of cheetahs have been reported in this park over the last few decades. Poche (1973) reported only 6 direct observations over a 3 year period, and worried about the future of the species in this park. Koster (1981) reported that cheetahs were rarely seen in the park. He assumed that although the population size of the smaller antelope prey species appeared to be fairly large, the wooded Savanna was perhaps poorly suited to cheetah hunting behaviour. He doubted that the cheetah remained in the park during the rainy season and supposed that this felid returned only after the vegetation had been burned. Grettenerger (1987) reported that the cheetah was very rare in this area: according to several sightings made each year; he estimated that “3 to 4 pairs” were probably present. The author linked this small number with overhunting and lack of open habitat.

In 1993, Stacey Van Syckle and collaborators from Peace Corps created a sighting survey in order to collect cheetah observations in the W National Park Niger. Some of these were published by Van Syckle (1996), who reported 22 observations of cheetahs in the park from 1993 – 1995. In order to investigate the status of the cheetah in W National Park Niger and the Tamou total reserve of fauna (750 km², which adjoins it, a team from IRD/MNHN collected sightings of cheetahs from 1972 to 2003, as well as information about cheetah habitat (Fig.1) in this area. In this paper, we present the results of this investigation.

Methods
Survey - The cheetah observation data were mainly collected through field interviews from January 1993 to November 1999 by Peace Corps volunteers and in March 2003 by IRD/MNHN and DFPP team members, using a standard sighting form with the following items: date and hour of observation, name of observer, total number of cheetahs, their sex, age (adult, subadult, young), location of the sighting, distance of observation and type of habitat, occurrence of burned areas and general comments such as behaviour, competitor or prey in the vicinity. Locations of sightings were pin pointed on a 1/200.000 IGNN map. When needed, locations were extrapolated with respect to the distance in kilometres from road intersections.

Guides, biologists, park staff and tourists were interviewed at the park administration office, where the park staff and the guides are based, as well as in the Nigercar campsite, where visitors and guides often spend the night. During the March 2003 survey, interviews were also carried out in the village of Moli Haoussa in the Tamou total reserve of fauna, where herders and most of the park guides live. Additional data including track reports collected by Peace Corps volunteers in 1972, 1973 and 1980 were also considered, as well as informations on the possible threats faced by cheetah (poaching, other causes of mortality cheetah such as fires).

Evaluation of cheetah number - The most recent dry season sighting records (November 2002 – March 2003) were selected, and date, location and social structure data were cartographed in order to identify the individuals and groups observed at each locality. Data were cross-referenced to estimate the minimum number of cheetahs present in the park at the time of the survey. In order to avoid double counting, simultaneous sightings in areas separated by less than 5 km (Gros 2002) were excluded from the total count of cheetahs.

Results
Cheetah observations and estimated number - 79 cheetah observations were reported between 1972 and 2003. The reports contained 74 observations with

Fig. 1. The W National Park Niger offers different kinds of habitat to cheetahs: spotted bush, woodland and shrubland Savanna. It lies between three rivers, the Mekrou and the Tapoa rivers which dry out part of the year, and the Niger river (this picture; photo: F. Claro).
location which were considered for mapping (Fig. 2). For 67 sightings, the number of individuals was known. 40.3% of the observations were of solitary cheetahs and 60% were groups (25% with 2 individuals + 34% with more than 2 individuals). Groups consisted of 2 to 7 individuals with an average group size of 3. For 30% of the sightings, the sex of the animals was mentioned. 32.5% of observations were of solitary cheetahs and 60% were groups (25% with 2 individuals + 3% with more than 2 individuals). Groups consisted of 2 to 7 individuals with an average group size of 3.

For 30% of the sightings, the sex of the animals was mentioned. 32.5% of groups were adults with immature, 37.5% were adults only and 30% of groups were individuals of unknown age. For family groups, 15.4% consisted of an adult female with young, 7.7% of an adult female with young and one animal of unidentified age, and 84.6% were two adults with young. The average litter size was 2.1 and the average number of young with mother was 3.

The number of observations per year varied from 0 to 14, with a mean value of 6.3 for the period 1993–2003. During these years no observations were collected for 2000 and only one observation was obtained for 2001. 78% of the sightings were reported during the dry season, from November to April.

18 cheetah sightings were reported during the 2002–2003 dry season, and the estimated number of cheetah present in the study area at the end of this period was 15–21 cheetahs including immature animals (one sub-adult and 3 to 7 juveniles).

Potential prey species - 13 potential ungulate prey were identified as suitable for cheetah in W National Park, Niger (Table 1). Interviews reported that cheetahs had been seen hunting Helmeted guineafowl *Numida meleagris*, chasing or stalking Patas monkeys *Erythrocephus patas*, and that they also hunted Defassa waterbuck *Kobus ellipsiprymnus* and roan antelope *Hippotragus equinus*. One sighting reported a cheetah chasing a red-fronted gazelle *Gazella ruffions* and one other sighting reported a cheetah eating an oribi *Ourebia ourebi*, and carrying the oribi away to the hill.

Competitor-predators - According to our survey, at least three other species of large predators are present in the region: the lion *Panthera leo*, the spotted hyena *Crocuta crocuta* and the striped hyena *Hyena hyena* (Kombi, pers. comm., Rabeil 2003). The occurrence of the African wild dog *Lycaon pictus* is unlikely but this has to be confirmed. The occurrence of the leopard *Panthera pardus* is suspected according to the description by a seasonal worker in early 2003 of a spotted felid jumping from a tree branch. No numbers are available for lion and hyaena, but these species are well known by local people.

Poaching and other potential factors of cheetah mortality - No report of poaching of cheetah was collected. Villagers living outside the park along the Mekrou river who used to hunt in the park before its establishment, reported that cheetah products were used traditionally. In Niamey market, we did not find any cheetah skin, as did Myers (1975) 30 years before, although we found 2 skins of leopard, which may confirm the occurrence of this latter species at least in the region. However, we were told that it was possible to get a cheetah skin upon request.

No data on other factors inducing cheetah mortality was available. However, in the park, management fires are set each year by the staff after the rain season and illegal late and destructive fires are set by poachers for better hunting visibility and by herders for conducting cattle through the park.

Discussion

Cheetah observations - Although our survey may be biased by the distribution and frequency of observers across the different parts of the park, it shows that cheetahs are regularly seen in W National Park and Tamou total reserve of fauna, Niger, with up to 14 observati-
ons per year. The lack or low number of observations in 2000 and 2001 may be explained by the poor condition of the roads in the park. Most of the observations were made between November and April. The lower number of observations from May to October is due to rainfall, when the park is closed to tourists and roads are muddy.

Observations seem to be concentrated in certain regions of the study area (Fig. 2). These areas may provide a preferred habitat for cheetahs; however, this clumped distribution may also be due to a better visibility in these regions or a higher frequency of traffic on the corresponding roads.

The large amount of undetermined or incomplete sex/age determination as well as the amount of 2 adult with young versus female with young in the data collected likely reflects a bias in the identification of sex and age class by observers, and makes it difficult to assess the sex ratio and social structure in the study area.

The estimated minimum number of cheetah occurring in the study area at the time of the survey was 15 to 21 cheetahs including immature animals. This estimation may be biased at least by the observer abilities and sighting conditions, but on the other hand indirect methods of estimating cheetah density through interviews have been shown to give reliable results (Gros et al. 1996). If we consider our estimated number for comparison, the estimated cheetah density in the W National Park Niger would be 0.68–0.95 cheetahs/100 km², which is close to other densities reported or estimated in southern and eastern Africa (Namibia farmlands: 0.81 cheetahs/100 km², Marker et al. 2003; Kenya protected areas: 0.47 cheetahs/100 km², Gros 1998; Tanzania protected areas: 0.31–1.5 cheetahs/100 km², Gros 2002).

However, considering the lack of roads in several parts of the park (Fig. 2), it is possible that more cheetahs are living in the W National Park Niger.

Compared to the few observations of cheetahs in the 1970’s by Poche (1973) in the W National Park Niger, the number of cheetahs was higher in 2003. Several hypothesis can be proposed to explain an increase. First, there are no physical borders between the W National Park Niger and its counterparts in Benin and Burkina Faso, and it is possible that cheetahs have moved into Niger since then. Second, due to the development of agriculture in the Tamou total reserve of fauna, the cheetahs living in this reserve may have been pushed into or to the border of the W National Park Niger. Third, observations of cheetahs may be easier now, thanks to the development and/or better maintenance of roads, and due to increasing tourism.

Prey species - According to the literature, cheetah favours various prey weighing up to about 60 kg (Skinner & Smithers 1990). In the W National Park Niger, a variety of potential prey live, in particular small and medium sized ungulates, which are suitable as adult or young for either male, female and coalition cheetah (Caro 1994). Our survey reports that one cheetah was seen eating an oribi, and others were seen chasing various ungulates, guineafowls and stalking patas monkeys. Poche (1973) observed a male cheetah killing a young hartebeest and another solitary cheetah chasing an African rabbit Poelagus marjoaria, while Jameson & Crisler (1997) indicate that the preferred preys of cheetah in W National Park Niger are oribis, duikers, warthogs, gazelles, bystanders and guineafowls.

Predators and competitors - According to our survey, lions and hyenas coexist with cheetahs in the same areas, which probably results in some predation of cheetahs in the W National Park Niger. In the Serengeti, Laurenson (1994) found that 68 % of cubs died from predation in the lair. In W National Park Niger, hyena numbers are not available, but lion numbers have been estimated to range between 40 and 60 individuals. (Alou 2001, Chardonnnet 2002, Rabeil 2003). This number corresponds to a density of 1.8–2.8 lions/100 km², which is 2–4 fold of our estimated cheetah density. However, the density of cheetah predators in the W National Park Niger may not have such influence on the cheetah cub mortality than in the Serengeti, since the thicker vegetation may offer opportunities for cheetah to avoid lions and hyenas. In Matusadona National Park, Zimbabwe, Purchase (1998) suggested that cheetahs were able to avoid predation of cubs in the first 3 months to a large extent. The author proposed that the presence of thick vegetation in that protected area may enable females to hide cubs and allow young to disperse and hide themselves if attacked by other predators.

Poaching and fires - Our survey did not report any poaching of cheetahs in the W National Park and Tamou total reserve of fauna, Niger. Nevertheless, poaching is probably a major threat for cheetah survival at the national but also at the regional level. In Niger, wildlife species products come mainly from Nigeria to Niamey market (Taylor, pers. comm.), and in Benin’s adjoining protected

<table>
<thead>
<tr>
<th>Scientific name</th>
<th>Common name</th>
<th>Density ind/km² (after Rabeil, 2003)</th>
</tr>
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<tbody>
<tr>
<td>Phacochoerus aethiopicus</td>
<td>Warthog</td>
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</tr>
<tr>
<td>Tragelaphus scriptus</td>
<td>Bushbuck</td>
<td>0.25</td>
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<tr>
<td>Cephalophus rufilatus</td>
<td>Red flanked duiker</td>
<td>&lt; 0.001</td>
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<td>Sylvicapra grimmia</td>
<td>Common duiker</td>
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</tr>
<tr>
<td>Redunca redunca</td>
<td>Reedbuck</td>
<td>0.023</td>
</tr>
<tr>
<td>Kobus ellipsiprymnus</td>
<td>Defassa waterbuck</td>
<td>0.08</td>
</tr>
<tr>
<td>Kobus kob</td>
<td>Buffalo’s kob</td>
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</tr>
<tr>
<td>Hippotragus equinus</td>
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<td>Alcelaphus buselaphus</td>
<td>Hartebeest</td>
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</tr>
<tr>
<td>Damaliscus lunatus</td>
<td>Topi</td>
<td>0.023</td>
</tr>
<tr>
<td>Ourebia ouerei</td>
<td>Oribi</td>
<td>0.66</td>
</tr>
<tr>
<td>Syncerus caffer</td>
<td>Buffalo, unlikely prey</td>
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</tr>
<tr>
<td>Gazella rufifrons</td>
<td>Red fronted gazelle</td>
<td>0.045</td>
</tr>
</tbody>
</table>
areas, cheetah skins have been confiscated in recent years (I. Di Silvestre, pers. comm.). Illegal fires set late in the season by poachers and herders may also be responsible for some mortality of cheetah juveniles as in the Serengeti, Tanzania (Laurenson 1994, 1995).

Conclusions
Our survey showed that cheetahs have been present since at least 50 years in the W National Park and Tamou total reserve of fauna, Niger. In this area, several sightings have been made each year, and at least 15–21 cheetahs were estimated to be present at the beginning of 2003. Except in the southern aerodrome area, cheetahs have been rarely observed in Tamou total reserve of fauna, where the habitat has been mainly degraded by agricultural activities since 1976. It appears that cheetahs moved from or did not survive in most of the Tamou reserve, after agriculture was authorized. W National Park Niger on the other hand offers different kinds of suitable habitat for the cheetah and a number of prey species. Like in other African areas, cheetahs seem to stand human activities if suitable habitat is available, and interviews showed that they did not seem to be much disturbed by cars, nor by bicycles and walkers.

To better understand the cheetah conservation status in South Niger, more studies are needed on its ecology. Due to the vegetation cover, direct observations are difficult and better data could be obtained with telemetry. As a first step a specific and intensive monitoring effort to ensure capture success would be needed (ie identification of playtrees, camera trapping). This would help to evaluate the carrying capacity of the park for cheetahs. Such a study could be valuable not only at the national level, but also at a regional level since the W National Park Niger is part of the tri-national Benin/ Burkina Faso/ Niger W Park and also part of the larger protected area complex WAP (W-Arly–Pendjari).

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